WHAT IS CLAIMED IS:

1. An information recording medium for recording a real-time file containing real-time data in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file; the real-time data is recorded in at least two real-time extents each of which is allocated in logically contiguous sectors within the volume space; and

an $(i+1)^{th}$ real-time extent among the at least two real-time extents is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} real-time extent among the at least two real-time extents to a beginning of the $(i+1)^{th}$ real-time extent;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} real-time extent to the beginning of the $(i+1)^{th}$ real-time extent, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} real-time extent, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than $M - B(i-1)$ when $D(i) > M - B(i-1)$, where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from each of the at least two real-time extents by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} real-time extent.

2. An information recording medium according to claim 1, wherein D(i) is corrected so that $D(i) = (Vin - Vout) \times S(i) / Vin + B(i-1) - k \times (Vout \times Tk)$ when $D(i) > M - B(i-1)$, wherein:

Tk represents a maximum rotation wait time of the information recording medium; and

k represents an integer portion of $((D(i) + B(i-1) - M) / (Vout \times Tk) + 1)$.

3. An information recording medium according to claim 1, wherein each of the at least two real-time extents is allocated in physically contiguous sectors.

4. An information recording medium according to claim 1, wherein the file management information comprises location information indicating each of the at least two real-time extents.

5. An information recording medium according to claim 1, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

6. An information recording medium according to claim 1, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

7. An information recording medium according to claim 1, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

8. An information recording medium for recording a real-time file containing real-time data in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file; the real-time data is recorded in at least two real-time extents each of which is allocated in logically

contiguous sectors within the volume space; and

an $(i+1)^{th}$ real-time extent among the at least two real-time extents is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} real-time extent among the at least two real-time extents to a beginning of the $(i+1)^{th}$ real-time extent;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} real-time extent to the beginning of the $(i+1)^{th}$ real-time extent, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} real-time extent, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than $M - B(i-1)$ when $D(i) > M - B(i-1)$, where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from each of the at least two real-time extents by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} real-time extent,

wherein the real-time file is a file in which the real-time data is appended; and

wherein data of an already recorded real-time extent is recorded in a newly recorded real-time extent.

9. An information recording medium according to claim 8, wherein D(i) is corrected so that D(i) = (Vin - Vout) × S(i) / Vin + B(i-1) - k × (Vout×Tk) when D(i) > M - B(i-1), wherein:

Tk represents a maximum rotation wait time of the information recording medium; and

k represents an integer portion of ((D(i) + B(i-1) - M) / (Vout×Tk) + 1).

10. An information recording medium according to claim 8, wherein each of the at least two real-time extents is allocated in physically contiguous sectors.

11. An information recording medium according to claim 8, wherein the file management information comprises location information indicating each of the at least two real-time extents.

12. An information recording medium according to claim 8, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

13. An information recording medium according to claim 8, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

14. An information recording medium according to claim 8, wherein the file management information comprises, as an extended attribute, information representing a condition

under which the at least two real-time extents were positioned.

15. An information recording medium for recording a real-time file containing real-time data in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file; the real-time data is recorded in at least two real-time extents each of which is allocated in logically contiguous sectors within the volume space; and

an $(i+1)^{th}$ real-time extent among the at least two real-time extents is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} real-time extent among the at least two real-time extents to a beginning of the $(i+1)^{th}$ real-time extent;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} real-time extent to the beginning of the $(i+1)^{th}$ real-time extent, such that $B(i) = B(i-1) + D(i) - Vout \times$

T(i), assuming that B(0) = 0,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} real-time extent, such that D(i) = (Vin - Vout) × S(i) / Vin, wherein D(i) is corrected at least to a value equal to or smaller than M - B(i-1) when D(i) > M - B(i-1), where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from each of the at least two real-time extents by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} real-time extent,

wherein the real-time file is a file in which the real-time data is appended;

wherein the real-time data is compressed in an MPEG format; and

wherein data comprising one or more GOPs recorded at an end of the real-time file before appending is re-encoded and is recorded in a newly recorded real-time extent.

16. An information recording medium according to claim 15, wherein D(i) is corrected so that D(i) = (Vin - Vout) × S(i) / Vin + B(i-1) - k × (Vout×Tk) when D(i) > M - B(i-1), wherein:

Tk represents a maximum rotation wait time of the information recording medium; and

k represents an integer portion of ((D(i) + B(i-1) - M) / (Vout×Tk) + 1).

17. An information recording medium according to claim 15,

wherein each of the at least two real-time extents is allocated in physically contiguous sectors.

18. An information recording medium according to claim 15, wherein the file management information comprises location information indicating each of the at least two real-time extents.

19. An information recording medium according to claim 15, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

20. An information recording medium according to claim 15, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

21. An information recording medium according to claim 15, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

22. An information recording medium comprising a volume space for at least recording in sectors a file comprising data and file management information for managing the file, wherein:

the data comprises real-time data, the real-time data comprising at least one of video data and audio data;

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous

sectors within the volume space;

the file comprises at least one real-time extent;

a linking loss extent is positioned before each of the at least one real-time extent; and

a linking gap is formed in the at least one real-time extent.

23. An information recording medium according to claim 22, wherein the linking loss extent comprises one ECC block.

24. An information recording medium according to claim 22, wherein the file management information comprises location information indicating each of the at least one real-time extent.

25. An information recording medium according to claim 22, wherein the file management information comprises identification information for identifying the real-time file including real-time data.

26. An information recording medium according to claim 22,

wherein a data type bit is recorded in an area for recording physical additional information concerning each sector within the linking loss extent, the data type bit being used for identifying the linking loss extent; and

wherein the data type bit for the sector is set to 1 if a next sector is included within the linking loss extent, unless the sector is a linking sector.

27. An information recording medium according to claim 22,

wherein a runout area is formed before the linking gap; and

the real-time data is recorded in the runout area within

the linking loss extent.

28. A method for recording a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the method comprises the steps of:

searching for at least two areas satisfying a real-time reproduction condition from among a plurality of logically contiguous unused areas within the volume space, each of the at least two areas being designated as a pre-allocated area, an (i+1)th pre-allocated area among the at least two areas satisfying the real-time reproduction condition being defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} pre-allocated area among the at least two pre-allocated areas to a beginning of the $(i+1)^{th}$

pre-allocated area;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} pre-allocated area to the beginning of the $(i+1)^{th}$ pre-allocated area, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} pre-allocated area, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than $M - B(i-1)$ when $D(i) > M - B(i-1)$, where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from the pre-allocated area by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} pre-allocated area;

recording the real-time data in the pre-allocated area;

designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent; and

recording the file management information for managing the real-time data as the real-time file.

29. A method according to claim 28, wherein D(i) is corrected so that $D(i) = (Vin - Vout) \times S(i) / Vin + B(i-1) - k \times (Vout \times Tk)$ when $D(i) > M - B(i-1)$, wherein:

Tk represents a maximum rotation wait time of the information recording medium; and

k represents an integer portion of $((D(i) + B(i-1) - M) / (Vout \times Tk) + 1)$.

30. A method according to claim 28, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an ECC block-by-ECC block basis.

31. A method according to claim 28, wherein the file management information comprises location information indicating each of the at least two real-time extents.

32. A method according to claim 28, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

33. A method according to claim 28, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

34. A method according to claim 28, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

35. A method for recording a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for

temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the method comprises the steps of:

calculating whether or not each of the at least one real-time extent will cause an overflow in an amount of data stored in the buffer memory if the real-time extent is reproduced by the playback reference model;

when it is calculated that the real-time extent will cause an overflow, correcting the amount of data stored in the buffer memory to equal to or smaller than the size of the buffer memory;

calculating whether or not an underflow will occur in the amount of data stored in the buffer memory if the playback reference model accesses from the real-time extent to a newly-allocated pre-allocated area;

when it is calculated that an underflow will occur, searching for a real-time extent which will not cause an underflow, on accessing from the real-time extent to the pre-allocated area;

recording in the newly-allocated pre-allocated area the real-time data already recorded in the real-time extent which will cause an underflow;

recording real-time data to be appended in the newly-allocated pre-allocated area;

designating a set of logically contiguous sectors in

which real-time data is recorded as a real-time extent; and

recording the file management information.

36. A method according to claim 35, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an ECC block-by-ECC block basis.

37. A method according to claim 35, wherein the file management information comprises location information indicating each of the at least one real-time extent.

38. A method according to claim 35, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

39. A method according to claim 35, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

40. A method according to claim 35, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extent were positioned.

41. A method for appending a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the real-time file comprises data which is compressed in an MPEG format,

wherein the method comprises the steps of:

reading data recorded at an end of the real-time file before appending, the data comprising one or more GOPs;

re-encoding the data which has been read;

recording the re-encoded data in a newly allocated pre-allocated area;

recording real-time data to be appended in the newly-allocated pre-allocated area;

designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent; and

recording the file management information.

42. A method according to claim 41, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an ECC block-by-ECC block basis.

43. A method according to claim 41, wherein the file management information comprises location information indicating each of the at least one real-time extent.

44. A method according to claim 41, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

45. A method according to claim 41, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

46. A method according to claim 41, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

47. A method for recording information on an information recording medium comprising a volume space for at least recording in sectors a file comprising data and file management information for managing the file, comprising the steps of:

determining whether or not the file is a real-time file containing real-time data;

recording the file management information in the volume space;

recording the real-time data next to a linking loss extent if the file is determined to be a real-time file; and

responsive to a buffer underrun occurring during the recording of the real-time data, forming a linking gap in a real-time extent in which the real-time data is recorded.

48. A method according to claim 47, wherein the linking loss extent comprises one ECC block.

49. A method according to claim 47, wherein the file management information comprises location information indicating each real-time extent.

50. A method according to claim 47, wherein the file management information comprises identification information for identifying the real-time file including real-time data.

51. A method according to claim 47,

wherein a data type bit is recorded in an area for recording physical additional information concerning each sector within the linking loss extent, the data type bit being used for identifying the linking loss extent; and

wherein the data type bit for the sector is set to 1 if a next sector is included within the linking loss extent, unless the sector is a linking sector.

52. A method according to claim 47, further comprising a step of recording the real-time data in a runout area within the linking loss extent.

53. An information recording apparatus for recording a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the

information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file;

wherein the information recording apparatus comprises a file system processing section for: allocating at least two areas satisfying a real-time reproduction condition from among a plurality of logically contiguous unused areas within the volume space, each of the at least two areas being designated as a pre-allocated area; recording the real-time data and the file management information; designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent; and generating the file management information for managing the real-time data as the real-time file,

wherein an $(i+1)^{th}$ pre-allocated area among the at least two pre-allocated areas is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} pre-allocated area among the at least two pre-allocated areas to a beginning of an $(i+1)^{th}$ pre-allocated area among the at least two pre-allocated areas;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} pre-allocated area to the beginning of the $(i+1)^{th}$ pre-allocated area, such that $B(i) = B(i-1) + D(i) - Vout$

$\times$ T(i), assuming that B(0) = 0,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} pre-allocated area, such that D(i) = (Vin - Vout) $\times$ S(i) / Vin, wherein D(i) is corrected at least to a value equal to or smaller than M - B(i-1) when D(i) > M - B(i-1), where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from the pre-allocated area by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} pre-allocated area.

54. An information recording apparatus according to claim 53, wherein D(i) is corrected so that D(i) = (Vin - Vout) $\times$ S(i) / Vin + B(i-1) - k $\times$ (Vout$\times$Tk) when D(i) > M - B(i-1), wherein:

Tk represents a maximum rotation wait time of the information recording medium; and

k represents an integer portion of ((D(i) + B(i-1) - M) / (Vout$\times$Tk) + 1).

55. An information recording apparatus according to claim 53, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an ECC block-by-ECC block basis.

56. An information recording apparatus according to claim 53, wherein the file management information comprises location information indicating each real-time extent.

57. An information recording apparatus according to claim 53, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

58. An information recording apparatus according to claim 53, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

59. An information recording apparatus according to claim 53, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

60. An information recording apparatus for appending a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing

the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the information recording apparatus comprises:

a data amount calculation section for calculating whether or not each of the at least one real-time extent will cause an overflow in an amount of data stored in the buffer memory if the real-time extent is reproduced by the playback reference model; correcting the amount of data stored in the buffer memory to equal to or smaller than the size of the buffer memory when it is calculated that the real-time extent will cause an overflow; calculating whether or not an underflow will occur in the amount of data stored in the buffer memory if the playback reference model accesses from the real-time extent to a newly-allocated pre-allocated area; and searching for a real-time extent which will not cause an underflow, on accessing from the real-time extent to the pre-allocated area when it is calculated that an underflow will occur;

a data recording section for recording in the newly allocated pre-allocated area the real-time data already recorded in the real-time extent which will cause an underflow, and recording real-time data to be appended in the newly-allocated pre-allocated area; and

a file structure processing section for designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent and for generating and recording the file management information.

61. An information recording apparatus according to claim 60, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an

ECC block-by-ECC block basis.

62. An information recording apparatus according to claim 60, wherein the file management information comprises location information indicating each of the at least one real-time extent.

63. An information recording apparatus according to claim 60, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

64. An information recording apparatus according to claim 60, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

65. An information recording apparatus according to claim 60, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

66. An information recording apparatus for appending a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for

temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the real-time file comprises data which is compressed in an MPEG format,

wherein the information recording apparatus comprises:

a re-encoding section for reading data recorded at an end of the real-time file before appending, the data comprising one or more GOPs, re-encoding the data which has been read, and recording the re-encoded data in a newly allocated pre-allocated area; and

a file structure processing section for designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent and for generating and recording the file management information.

67. An information recording apparatus according to claim 66, wherein each of the at least one pre-allocated area is allocated in physically contiguous sectors on an ECC block-by-ECC block basis.

68. An information recording apparatus according to claim 66, wherein the file management information comprises location information indicating each of the at least two real-time extents.

69. An information recording apparatus according to claim 66, wherein the file management information comprises first identification information for identifying the real-time file including real-time data.

70. An information recording apparatus according to claim 66, wherein the file management information comprises second identification information for indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition.

71. An information recording apparatus according to claim 66, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned.

72. An information recording apparatus for recording information on an information recording medium comprising a volume space for at least recording in sectors a file comprising data and file management information for managing the file, comprising:

a recording mode determination section for determining whether or not the file is a real-time file containing real-time data;

a file structure processing section for recording the file management information in the volume space;

a linking setting section for recording the real-time data next to a linking loss extent if the file is determined to be a real-time file; and

a linking controller for, responsive to a buffer underrun occurring during the recording of the real-time data, forming a linking gap in a real-time extent in which

the real-time data is recorded.

73. An information recording apparatus according to claim 72, wherein the linking loss extent comprises one ECC block.

74. An information recording apparatus according to claim 72, wherein the file management information comprises location information indicating each real-time extent.

75. An information recording apparatus according to claim 72, wherein the file management information comprises identification information for identifying the real-time file including real-time data.

76. An information recording apparatus according to claim 72,

wherein the linking controller records a data type bit in an area for recording physical additional information concerning each sector within the linking loss extent, the data type bit being used for identifying the linking loss extent; and

wherein the data type bit for the sector is set to 1 if a next sector is included within the linking loss extent, unless the sector is a linking sector.

77. An information recording apparatus according to claim 72, further comprising a runout controller for recording the real-time data in a runout area within the linking loss extent.

78. A system controller for an information recording apparatus for recording a real-time file containing

real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file;

wherein the system controller comprises a file system processing section for: allocating at least two areas satisfying a real-time reproduction condition from among a plurality of logically contiguous unused areas within the volume space, each of the at least two areas being designated as a pre-allocated area; recording the real-time data and the file management information; designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent; and generating the file management information for managing the real-time data as the real-time file,

wherein an $(i+1)^{th}$ pre-allocated area among the at least two pre-allocated areas is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} pre-allocated area among the at least two pre-allocated areas to a beginning of an $(i+1)^{th}$

pre-allocated area among the at least two pre-allocated areas;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} pre-allocated area to the beginning of the $(i+1)^{th}$ pre-allocated area, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} pre-allocated area, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than $M - B(i-1)$ when $D(i) > M - B(i-1)$, where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from the at pre-allocated are by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} pre-allocated area.

79. A system controller for an information recording apparatus for appending a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from

the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space,

wherein the system controller comprises:

a data amount calculation section for calculating whether or not each of the at least one real-time extent will cause an overflow in an amount of data stored in the buffer memory if the real-time extent is reproduced by the playback reference model; correcting the amount of data stored in the buffer memory to equal to or smaller than the size of the buffer memory when it is calculated that the real-time extent will cause an overflow; calculating whether or not an underflow will occur in the amount of data stored in the buffer memory if the playback reference model accesses from the real-time extent to a newly-allocated pre-allocated area; and searching for a real-time extent which will not cause an underflow, on accessing from the real-time extent to the pre-allocated area when it is calculated that an underflow will occur;

a data recording section for recording in the newly allocated pre-allocated area the real-time data already recorded in the real-time extent which will cause an underflow, and recording real-time data to be appended in the newly-allocated pre-allocated area; and

a file structure processing section for designating a set of logically contiguous sectors in which real-time data is recorded as a real-time extent and for generating and recording the file management information.

80. A method for reproducing a real-time file containing real-time data on an information recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

wherein the real-time data is recorded in at least two real-time extents each of which is allocated in logically contiguous sectors within the volume space; and

an $(i+1)^{th}$ real-time extent among the at least two real-time extents is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} real-time extent among the at least two real-time extents to a beginning of the $(i+1)^{th}$ real-time extent;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} real-time extent to the beginning of the $(i+1)^{th}$ real-time extent, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the pickup reading the data from the i^{th} real-time extent, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than M - B(i-1) when D(i) > M - B(i-1), where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from each of the at least two real-time extents by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} real-time extent,

wherein the method comprises the steps of:

reproducing the real-time file from the information recording medium by means of a disk drive;

acquiring location information of each of the at least two real-time extents and identification information indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition;

reading data from the at least two real-time extents at a data transfer rate which is equal to or greater than Vin of the playback reference model;

temporarily storing the real-time data which has been read in the buffer memory;

reading the data stored in the buffer memory and decoding the data in a decoder; and

accessing a next real-time extent within the time T(i) of the playback reference model.

81. A method according to claim 80, wherein the file

management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned, the method further comprising a step of:

reading the extended attribute from the file management information, and informing a reproduction mode to the disk drive based on the extended attribute prior to reproduction.

82. A method for reproducing real-time data from an information recording medium comprising a volume space for at least recording in sectors a file comprising data and file management information for managing the file, wherein:

the data comprises real-time data, the real-time data comprising at least one of video data and audio data;

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space;

the file comprises at least one real-time extent;

a linking loss extent is positioned before each of the at least one real-time extent; and

a linking gap is formed in the at least one real-time extent,

wherein the method comprises the steps of:

determining whether or not the file is a real-time file containing real-time data; and

performing a reproduction operation for data recorded in a real-time extent, the reproduction operation being continuously performed without performing a recovery process even if a reproduction error due to invalid data recorded in the linking gap occurs.

83. An information reproduction apparatus for reproducing a real-time file containing real-time data on an information

recording medium in such a manner that the real-time data is continuously reproducible by a playback reference model, the real-time data comprising at least one of video data and audio data,

wherein the playback reference model includes:

a pickup for reading the real-time data from the information recording medium; a buffer memory for temporarily storing the real-time data read by the pickup; and a decoder module for reading the real-time data from the buffer memory for processing,

wherein the information recording medium comprises a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

wherein the real-time data is recorded in at least two real-time extents each of which is allocated in logically contiguous sectors within the volume space; and

an $(i+1)^{th}$ real-time extent among the at least two real-time extents is positioned at a position satisfying a real-time reproduction condition defined as:

$$T(i) \leqq (B(i-1) + D(i))/Vout,$$

wherein:

T(i) represents a time required for the pickup to access from an end of an i^{th} real-time extent among the at least two real-time extents to a beginning of the $(i+1)^{th}$ real-time extent;

B(i) represents an amount of data having been stored in the buffer memory when the pickup accesses from the end of the i^{th} real-time extent to the beginning of the $(i+1)^{th}$ real-time extent, such that $B(i) = B(i-1) + D(i) - Vout \times T(i)$, assuming that $B(0) = 0$,

D(i) represents an increase in the amount of data having been stored in the buffer memory responsive to the

pickup reading the data from the i^{th} real-time extent, such that $D(i) = (Vin - Vout) \times S(i) / Vin$, wherein D(i) is corrected at least to a value equal to or smaller than M - B(i-1) when D(i) > M - B(i-1), where M represents a size of the buffer memory;

Vout represents a data transfer rate when the data is transferred from the buffer memory to the decoder module;

Vin represents a data transfer rate when the data is read from each of the at least two real-time extents by the pickup and transferred to the buffer memory; and

S(i) represents a data size of the i^{th} real-time extent,

wherein the information reproduction apparatus comprises:

a disk drive for reproducing the real-time file from the information recording medium;

a file structure processing section for acquiring location information of each of the at least two real-time extents and identification information indicating that the at least two real-time extents are positioned in accordance with the real-time reproduction condition;

a data reproducer for reading data from the at least two real-time extents at a data transfer rate which is equal to or greater than Vin of the playback reference model;

a buffer memory for temporarily storing the real-time data which has been read; and

a decoder for reading the data stored in the buffer memory and decoding the data,

wherein a data reproduction performance which is determined as a function of an access performance and data transfer rate of the data reproducer and a size of the buffer memory satisfies a predetermined data reproduction performance of the playback reference model.

84. An information reproduction apparatus according to claim 83, wherein the file management information comprises, as an extended attribute, information representing a condition under which the at least two real-time extents were positioned, the information reproduction apparatus further comprising:

a reproduction mode informing section for reading the extended attribute from the file management information, and informing a reproduction mode to the disk drive based on the extended attribute prior to reproduction.

85. An information reproduction apparatus for reproducing a real-time file containing real-time data on an information recording medium comprising a volume space for at least recording in sectors a file comprising data and file management information for managing the file,

wherein:

the data comprises real-time data, the real-time data comprising at least one of video data and audio data;

the real-time data is recorded in at least one real-time extent each of which is allocated in logically contiguous sectors within the volume space;

the file comprises at least one real-time extent;

a linking loss extent is positioned before each of the at least one real-time extent; and

a linking gap is formed in the at least one real-time extent,

wherein the information reproduction apparatus comprises:

a file structure processing section for determining whether or not the file is a real-time file containing real-time data; and

a data reproducer for performing a reproduction operation for data recorded in a real-time extent, the reproduction operation being continuously performed without performing a recovery process even if a reproduction error due to invalid data recorded in the linking gap occurs.